Mercury Wastewater Problem at Army Medical Facilities

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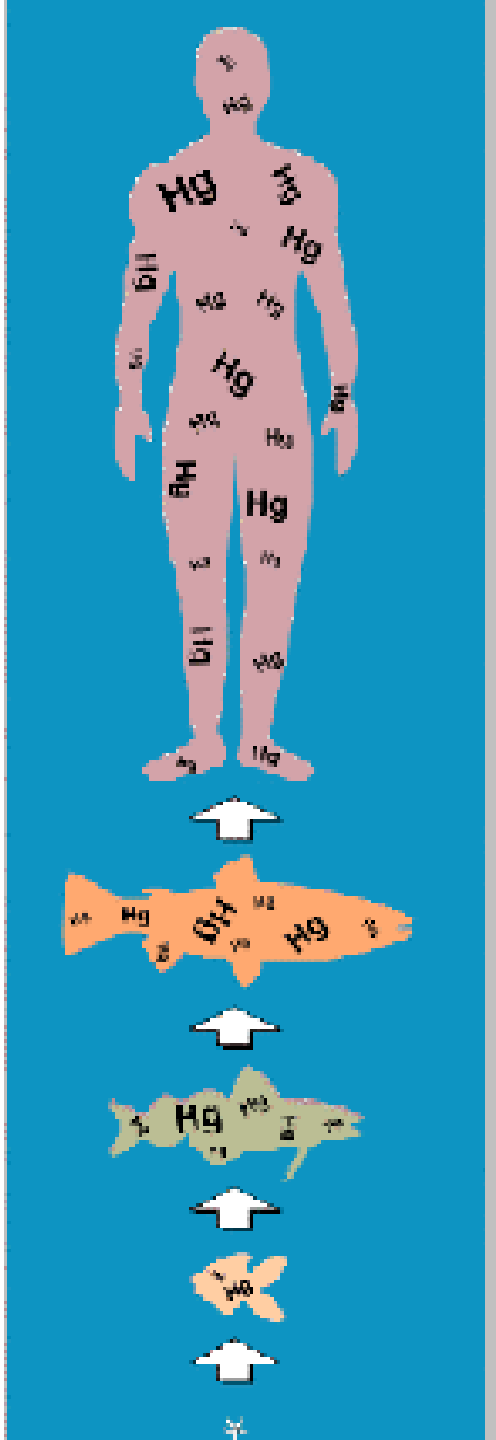
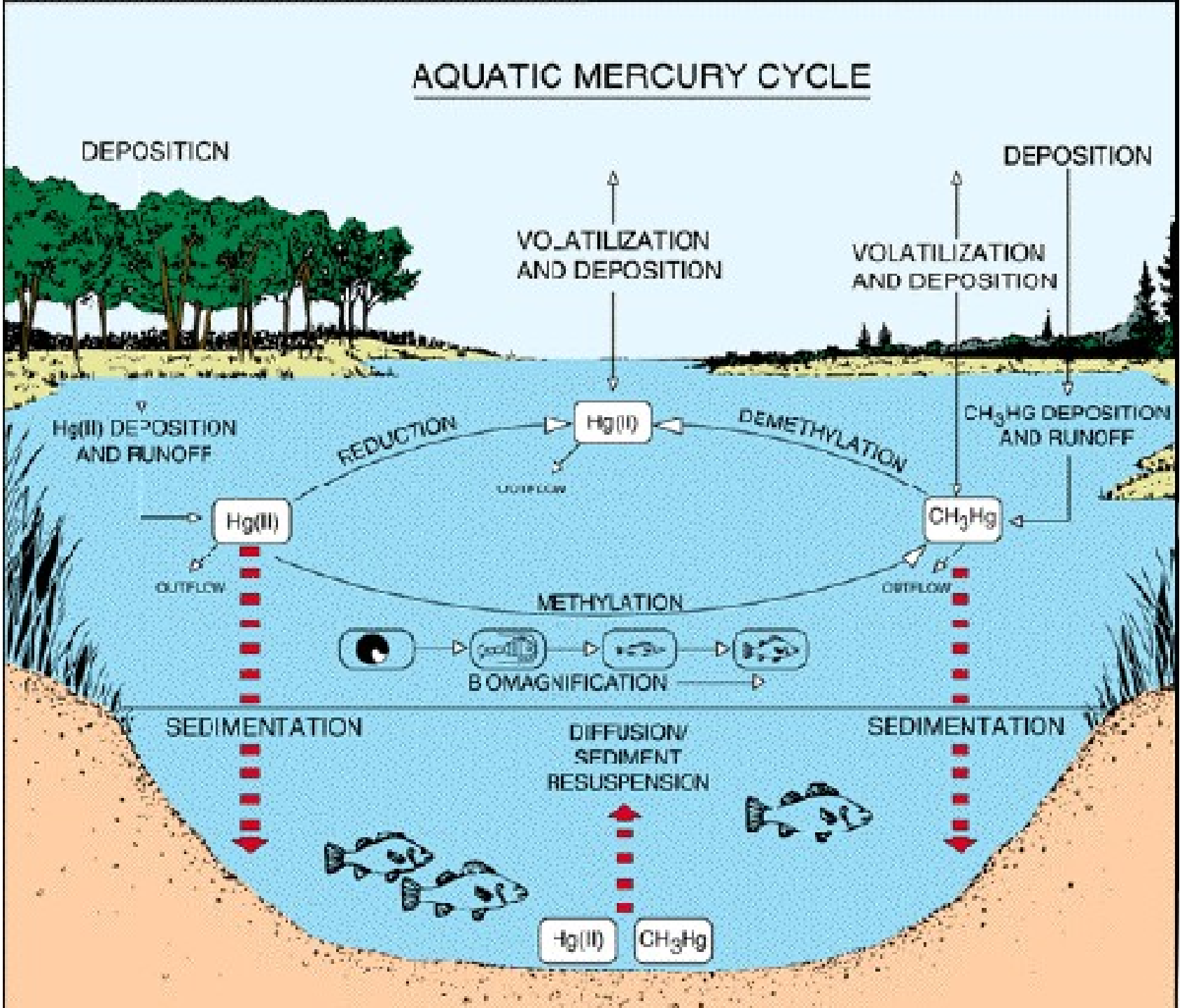
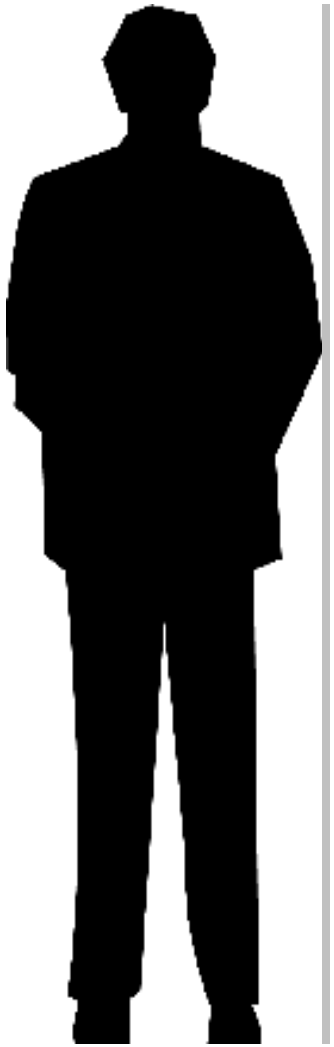
Mercury Environmental Problem

- Bioaccumulation
- Biomagnification
- Concentration in the muscle tissue




AQUATIC MERCURY CYCLE
DEPOSITION
VOLATILIZATION AND DEPOSITION
DEPOSITION
VOLATILIZATION AND DEPOSITION
Hg(II) DEPOSITION AND RUNOFF
REDUCTION
Hg(II)
DEMETHYLATION
CH3HG DEPOSITION AND RUNOFF
OUTFLOW
Hg(II)
CH3Hg
OUTFLOW
OUTFLOW
METHYLATION
BIOMAGNIFICATION
SEDIMENTATION
DIFFUSION/ SEDIMENT RESUSPENSION
SEDIMENTATION
Hg(II)
CH3Hg

Mercury Health Effects



- Methylmercury affects the central nervous system
- Fish consumption advisory for mercury is 1 ppm
- Unborn children are at the greatest risk
  - Neurological effects occur at 5-10 times lower intake levels of methylmercury

Reducing Contaminants in Surface Waters

- Local waterway identified as being impaired
  - Not meeting a State water quality standard
- Leads to development of TMDL
  - Restricts contaminant loading to waterway
  - Distributes acceptable load among sources
- End result: more stringent wastewater discharge limits

Mercury TMDL

- 12 ng/L federal criterion – freshwater, chronic
- 2.8 ng/L instream WQS – result of TMDL
- 2.8 ng/L Hg discharge limit
- 36-73 ng/L – monitored WW discharge concentration

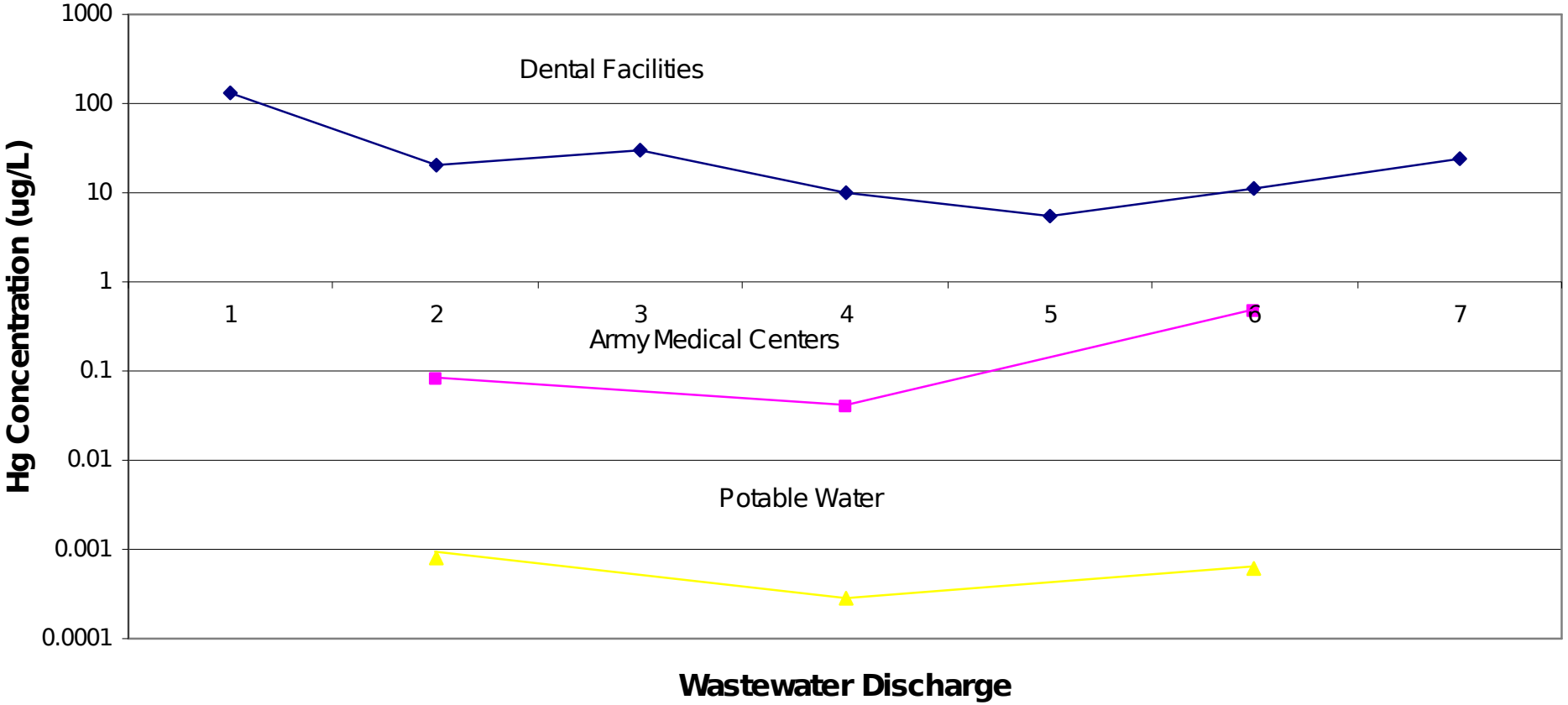
MEDCOM's Concern

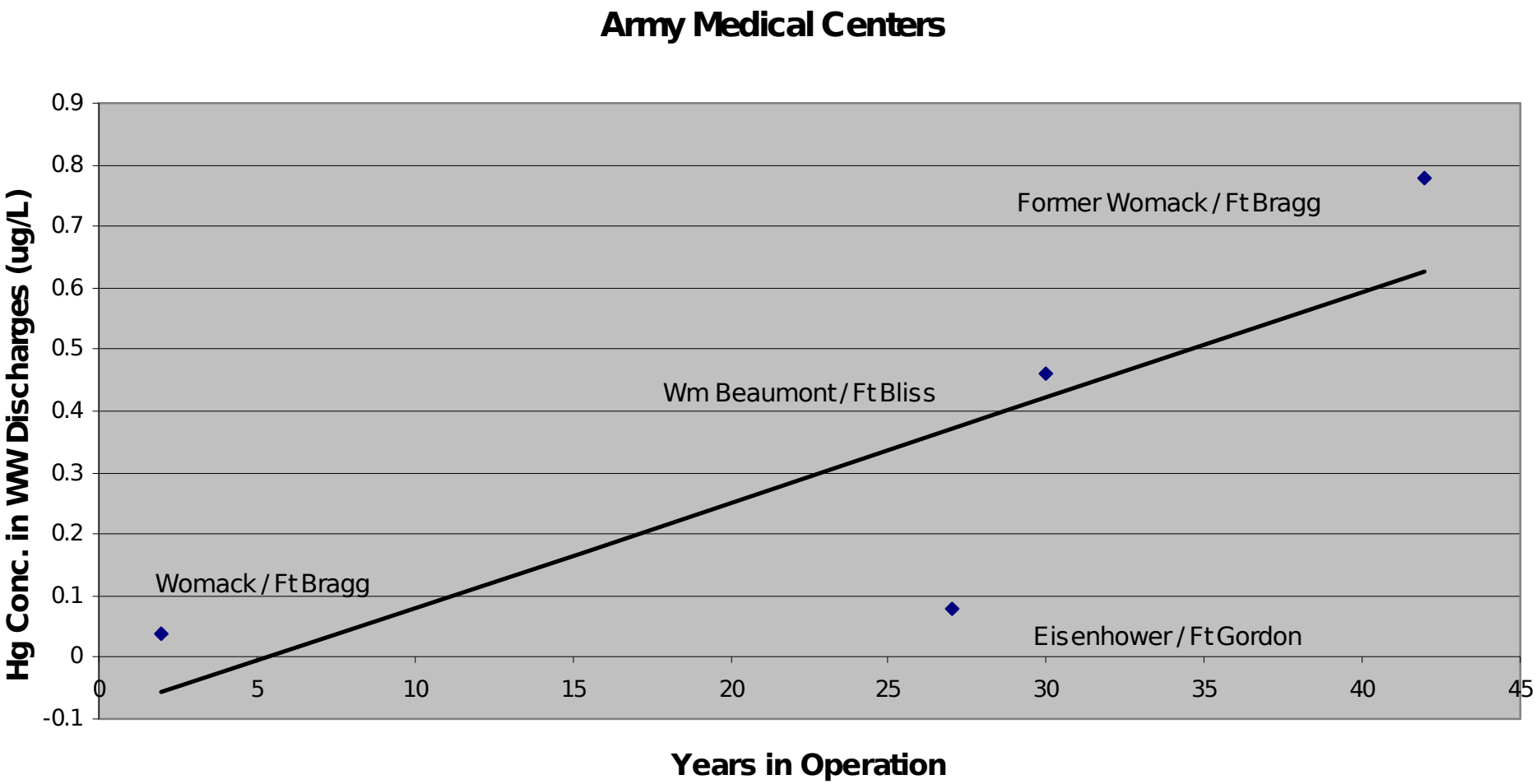
- Stringent Hg discharge limits could result in WW non-compliance and impact medical operations
- WRAMC - NOV
- How big was this problem?

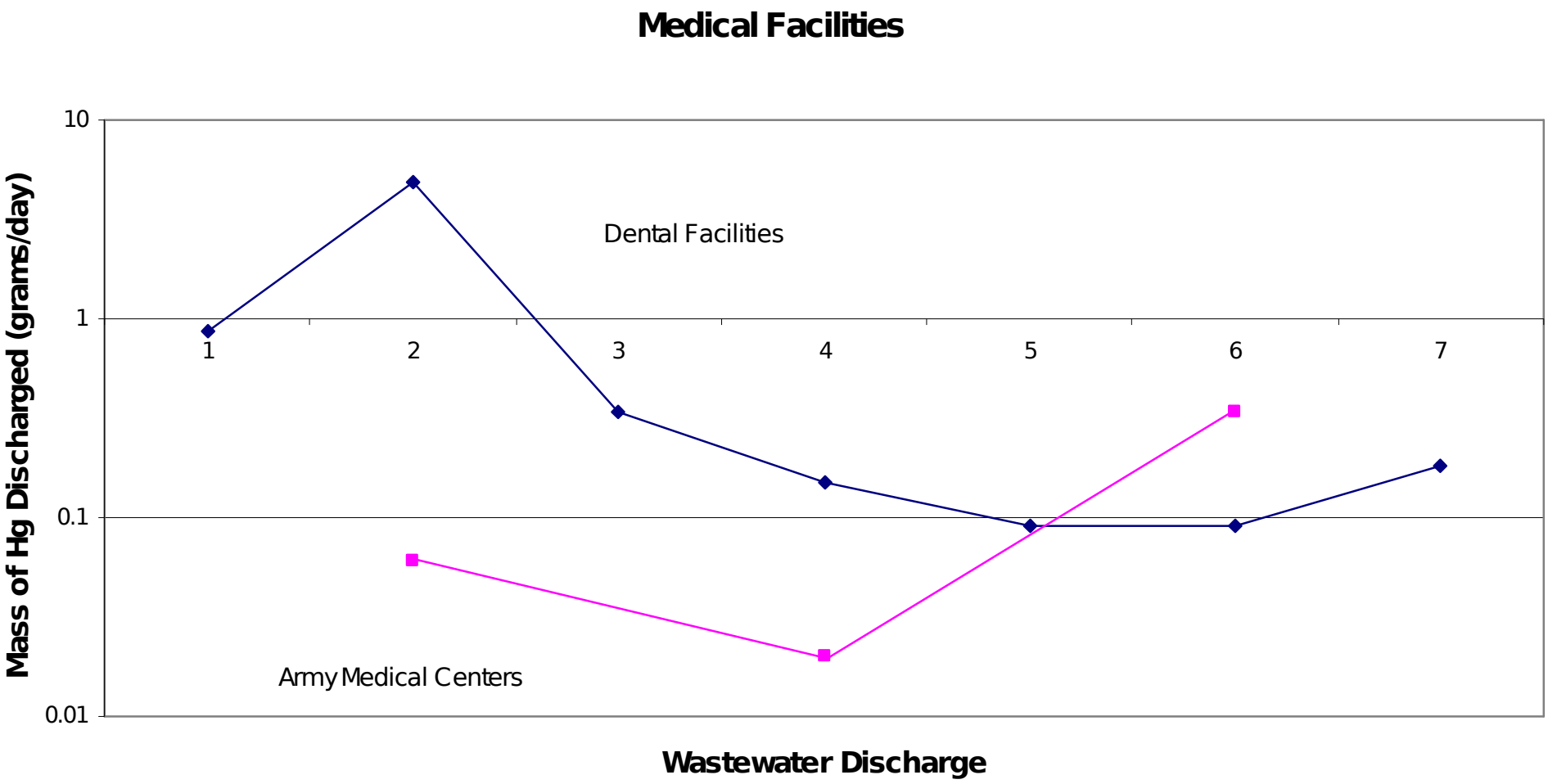
Monitored

- 3 medical centers
- 1 former medical center
- 6 dental clinics, or combination dental / health clinics
- 1 health clinic

Medical Facilities




Army Medical Centers
Hg Conc. in WW Discharges (ug/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0
5
10
15
20
25
30
35
40
45
Former Womack / Ft Bragg
Wm Beaumont / Ft Bliss
Womack / Ft Bragg
Eisenhower / Ft Gordon
Years in Operation


Medical Facilities
10
1
0.1
0.01
Mass of Hg Discharged (grams/day)
1
2
3
4
5
6
7
Dental Facilities
Army Medical Centers
Wastewater Discharge

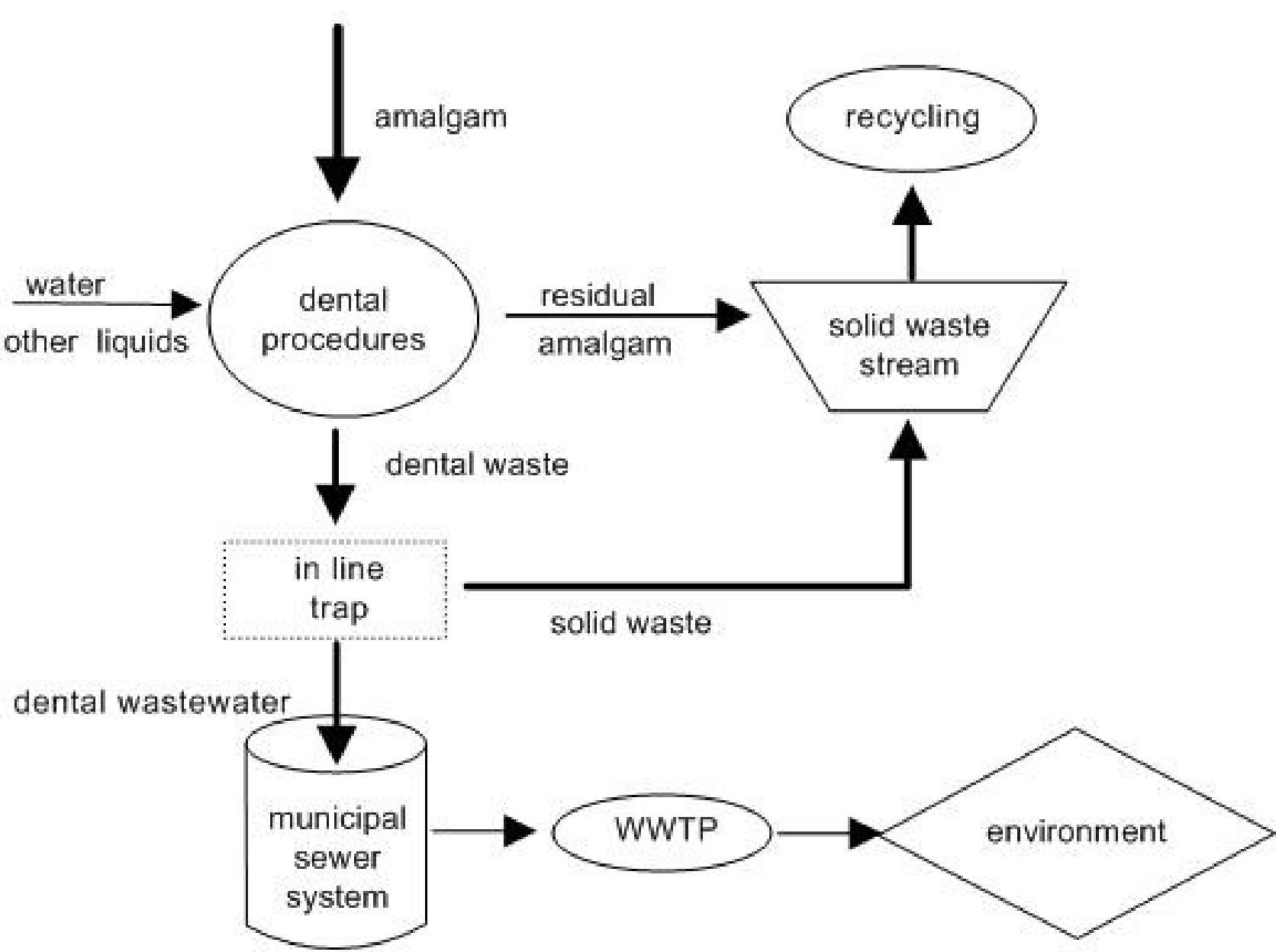
Learned in FY02

1. AMCs have similar Hg WW concentrations as commercial hospitals
2. Older facilities are discharging higher concentrations of Hg
3. Dental facilities are a significant source of Hg contamination

Dental Facilities

Dental Amalgam

- Composition: 42-52% mercury
- Historically, material of choice for most dental restorations
- Advantages over alternatives
  - Strength and durability
  - Ease of placement
  - Lower cost

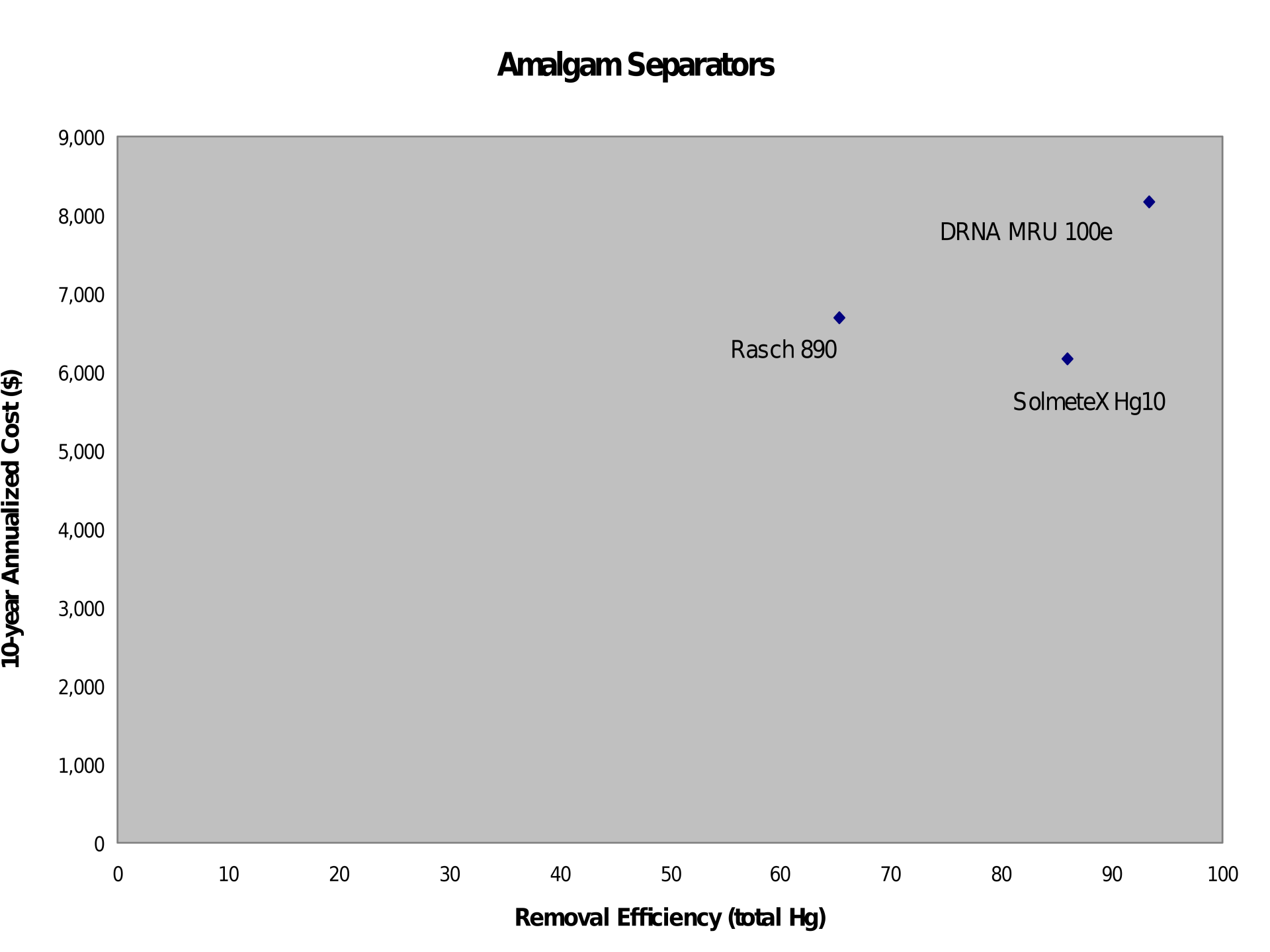

amalgam
recycling
water
other liquids
dental procedures
residual amalgam
solid waste stream
dental waste
in line trap
solid waste
dental wastewater
municipal sewer system
WWTP
environment

Dental WW Technology

- Amalgam separation devices
- ISO standard certified
  - 95% particle removal
- Primary technology
  - sedimentation
- Polishing treatment
  - filtration and ion exchang

Testing of Amalgam Separating Devices

- Units tested
  - Dental Recycling North America Inc. Mercury Removal Unit 100e
  - AB Dental Trend, Inc. Rasch 890
  - SolmeteX Hg10
- Location
  - Snyder Dental Facility,
    Ft Gordon


Amalgam Separators
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
10-year Annualized Cost ($)
DRNA MRU 100e
Rasch 890
SolmeteX Hg10
0
10
20
30
40
50
60
70
80
90
100
Removal Efficiency (total Hg)

Learned in FY03 at Snyder Dental Clinic

1. Baseline dental WW discharge
   - low volume flow (1 – 10 gpd)
   - 2.6 grams/d of Hg (26% dissolved)
2. Amalgam separators were effective
   - removal efficiency (65-93%)
3. SOP needed for amalgam management

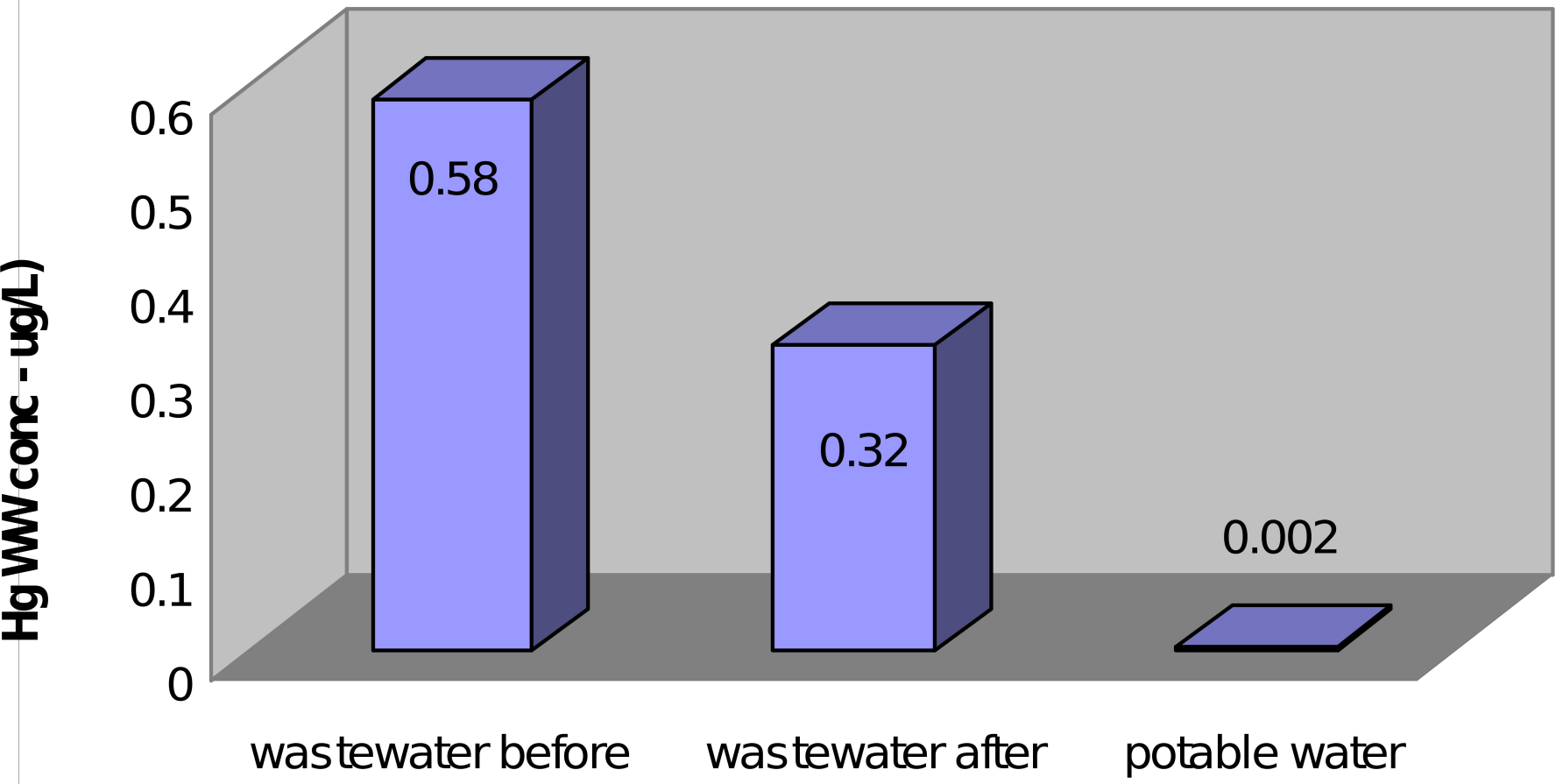
Call for Help

- Dewitt Army Hospital, Ft Belvoir
  - Found Hg in custodial sink
  - Measured Hg in five other custodial sinks
- Question – *can you reduce the Hg concentration in a hospital's wastewater discharg if you replace contaminated sink traps*?

Dewitt Army Hospital Evaluation

- Initial Evaluation
  - Tested every sink in hospital for Hg
  - Monitor WW discharge for Hg
- Findings
  - Only 9 sinks had any significant Hg
    - Concentrations far less than originally reported
  - Hg wastewater discharge conc. - .58 ug/L
- Proceeded with replacement of sink traps

Dewitt Army Hospital
(sink trap replacements)



Summary

- Hg environmental problem
  - Primary source is air
  - Industrial WW discharges heavily regulated
- Our studies show
  - Hospitals have contaminated plumbing
  - Dental discharges can be controlled with amalgam separating units